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(54) Analog/LCD watch with LED display

(57) The wrist watch comprising a permanently operating analog watch movement (6) or LCD display and incorporates an LED digital watch display (5) which is operable on demand to emit light and display the current time in numerals as determined by the LED watch drive circuit, thereby enabling the time to be read correctly and easily in the dark when the analog watch or LCD display cannot be read.

FIG. 1

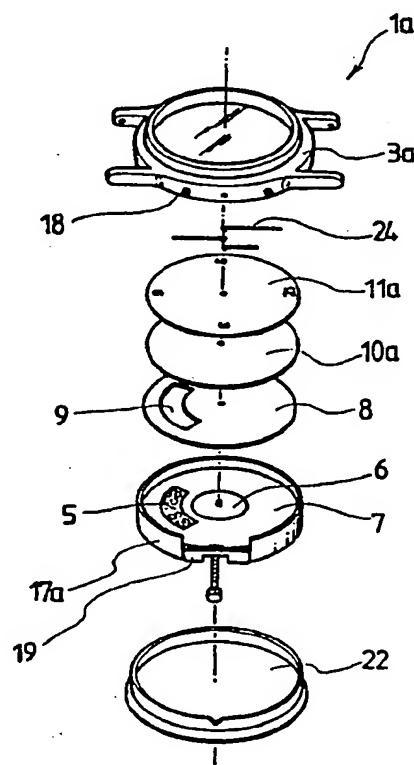


figure 6

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FIG. 1

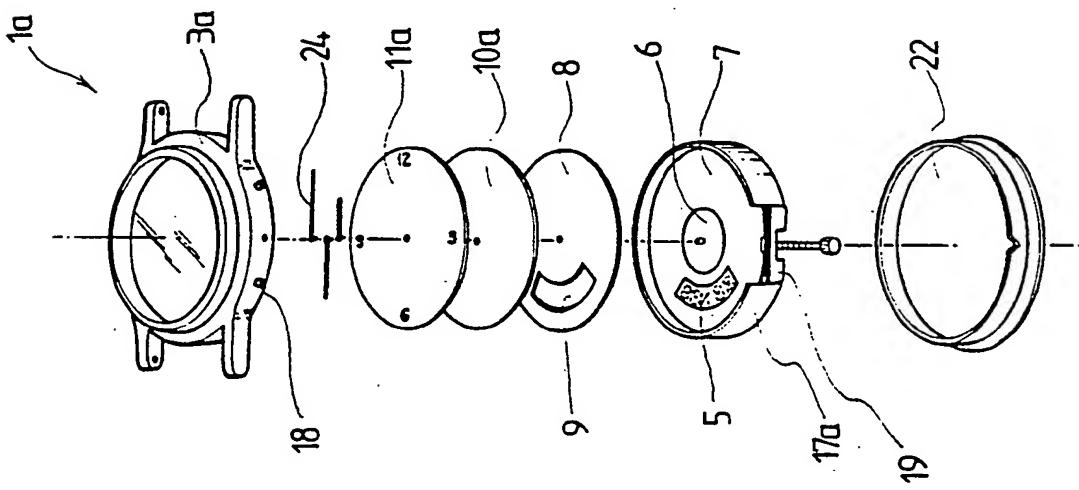
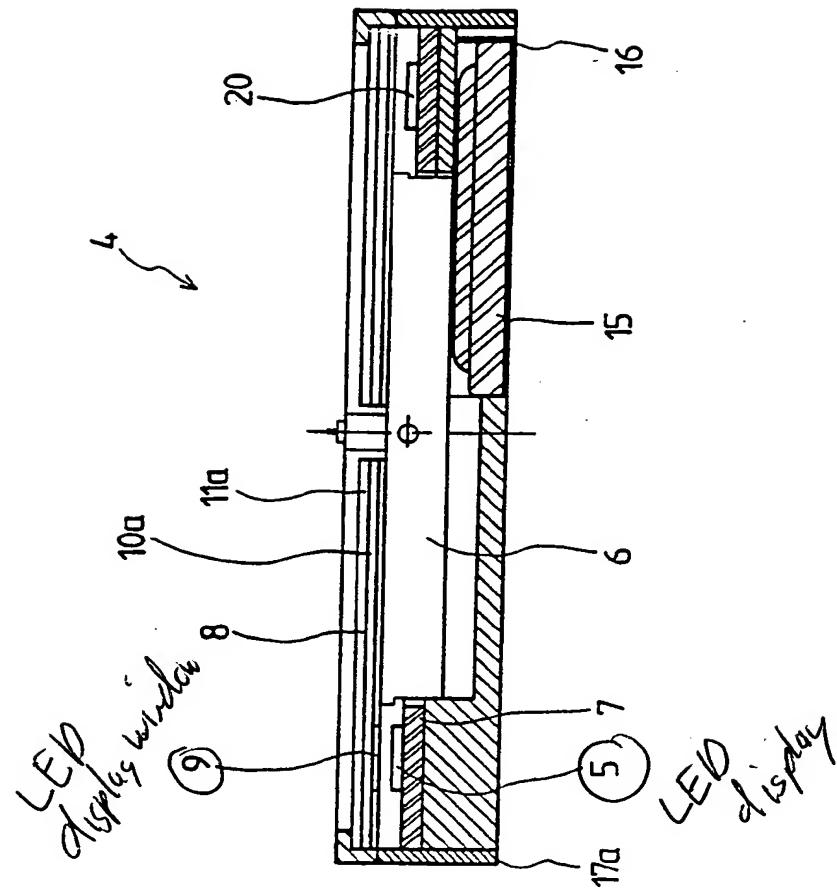


FIG. 2



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FIG. 3

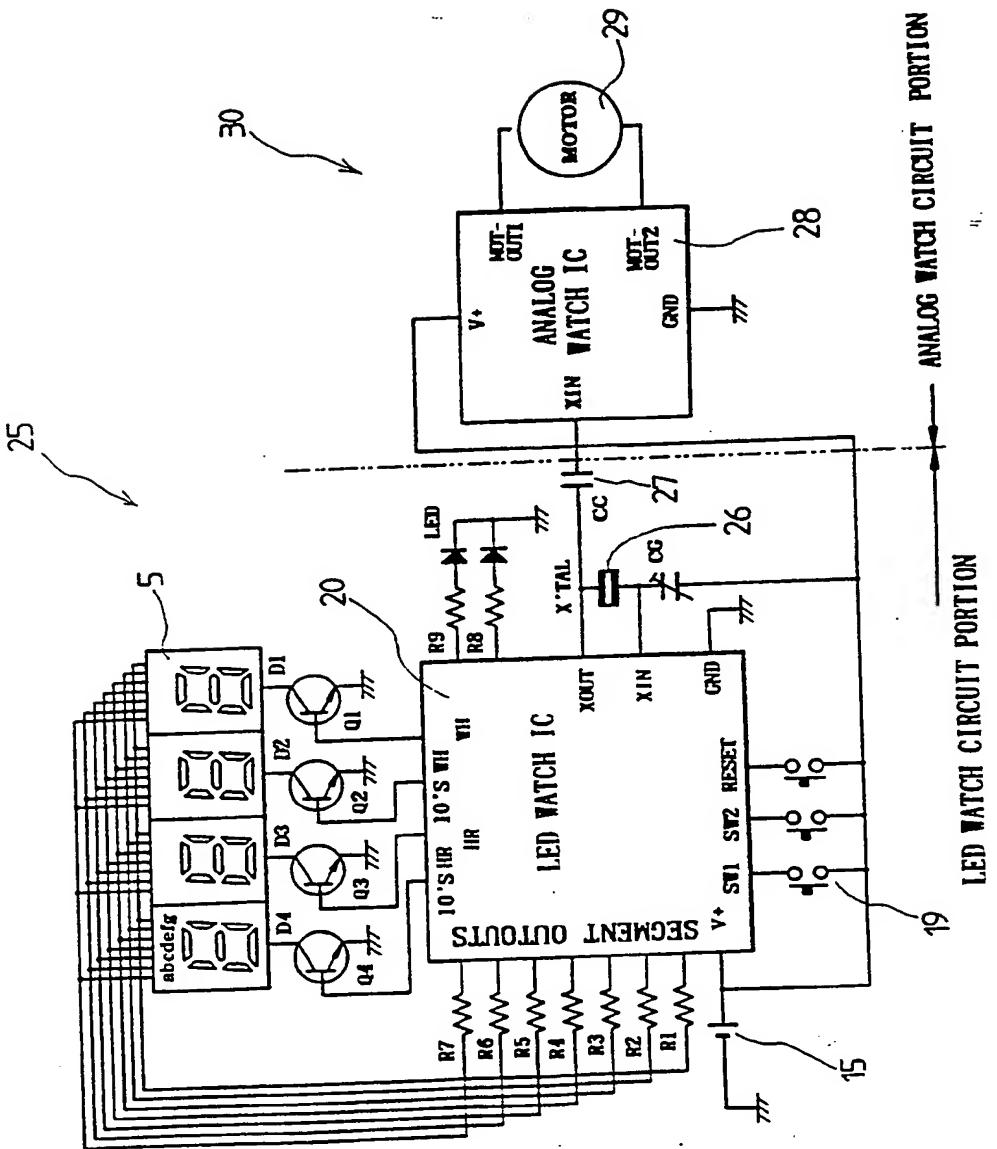


FIG. 4

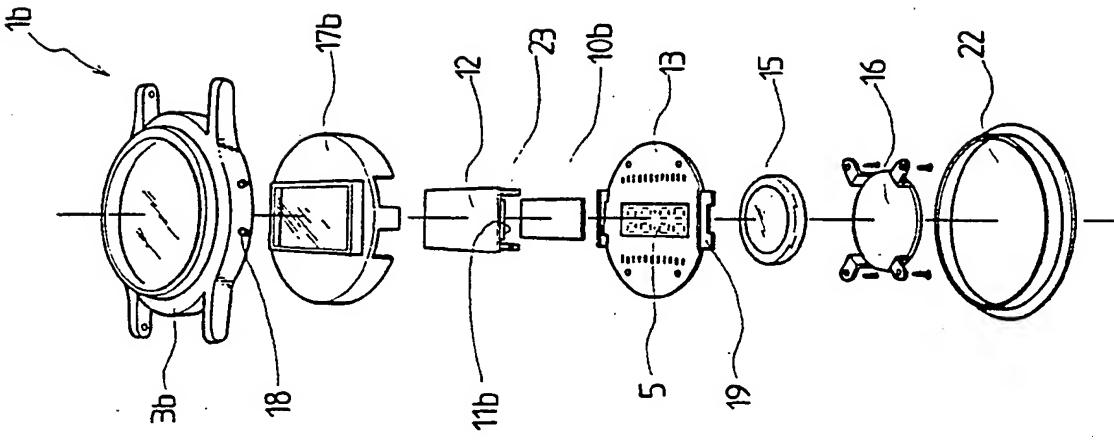
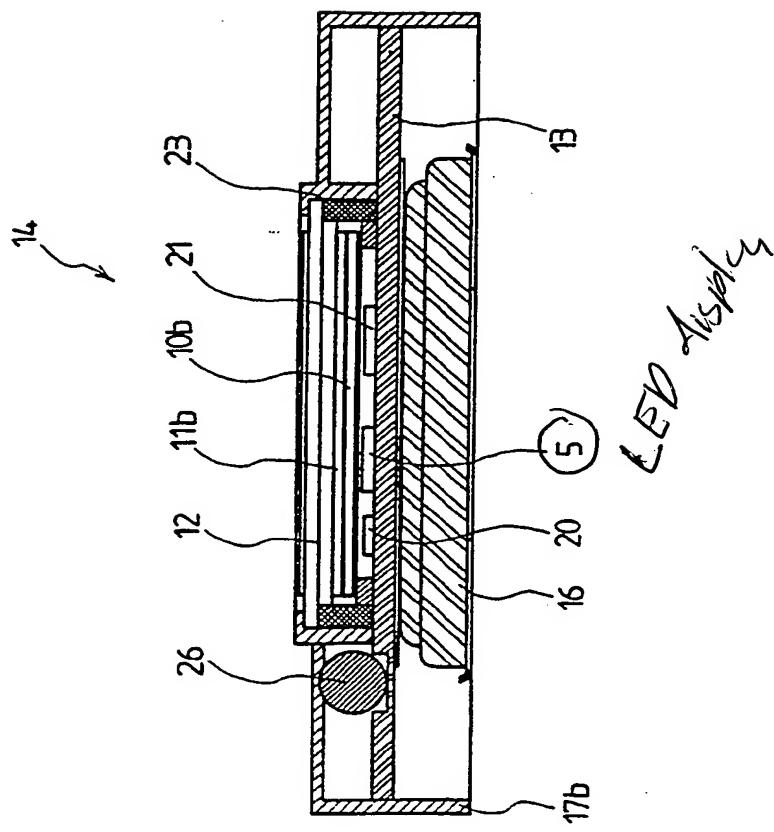


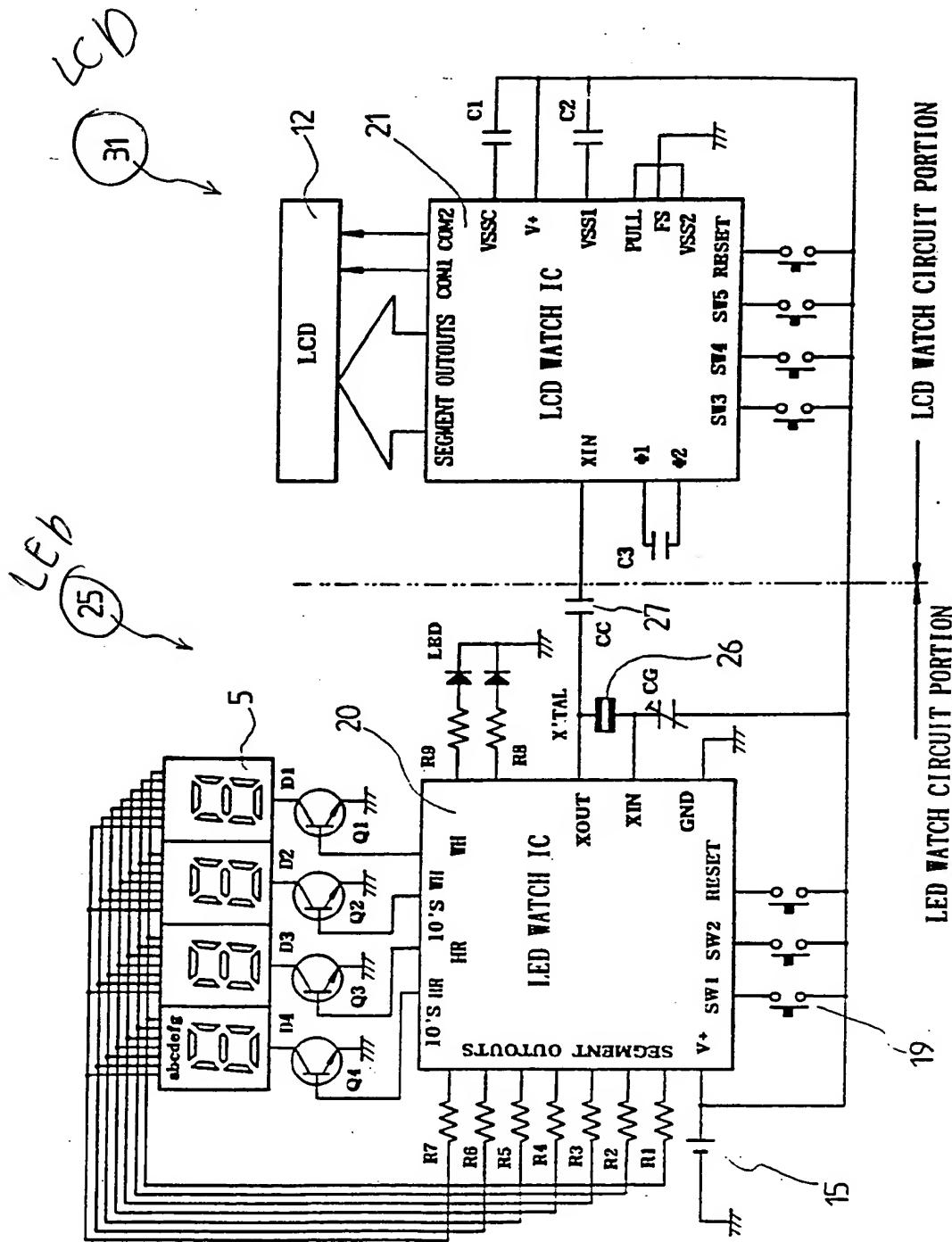
FIG. 5



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u.

FIG. 6



"Wrist watch with LED display"

This invention relates to a wrist watch with an LED display enabling reading of the time at night time, which watch permits the time to be read easily in the dark by indicating with the light emitted by the LED display the time provided by an IC circuit which has an LED watch function.

Wrist watches which are used nowadays are mostly analog watches which indicate the time by means of pointers or hands and digital watches which indicate the time in numerals displayed on a liquid crystal display (LCD).

Known wrist watches have the drawback that it is impossible to read the time without an outside light source. To obviate this drawback it is known to coat the hands of analog watches with luminous material which glow after exposure to light to enable the watch to be read in the dark. In the case of digital watches it is known to incorporate in the watch a small lamp operated by the watch battery, so that the time can be read in the dark when the lamp is illuminated.

In the case of the luminous coating used in analog watches, this glows in the dark after being exposed to light for a predetermined time period.

The small lamp used in digital watches has a specific structural character and as it is attached to one side surface of the LCD, its effect is very slight such

that the display can not always be seen clearly in the dark, and it is still difficult to read the correct time.

The present invention aims to obviate these drawbacks of known wrist watches.

Accordingly, the invention provides Claim 1.

The LED display, when operated, thus emits light so that the present time as indicated by the LED watch circuit portion is displayed in numerals.

The time can then be read correctly and easily in dark conditions when it is impossible to read the time from the analog watch hands or the LCD display.

Permanent time display proved impossible with former LED watches because of the excessive electric current consumption of LED displays but this defect is effectively overcome in an analog watch or LCD digital watch embodying the present invention.

In order that the invention may be more readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view showing an LED display incorporated in an analog watch in a first embodiment of a wrist watch according to the present invention;

Figure 2 is a sectional view showing an analog module which is the major part of the Figure 1 embodiment (12H-6H direction);

Figure 3 is a diagram of the electrical circuitry of the Figure 1 embodiment;

Figure 4 is an exploded perspective view showing an LED display incorporated in an LCD watch in a second embodiment of a wrist watch according to the present invention;

Figure 5 is a sectional view showing an LCD module which is the major part of the Figure 4 embodiment (12H-6H direction); and

Figure 6 is a diagram of the electrical circuitry of the Figure 5 embodiment.

In the first preferred embodiment of the invention, as shown in Figure 1, an analog wrist watch 1a comprises an analog watch movement 6 and an LED display 5 installed inside an ordinary wrist watch case 3a and connected to a circuit board 7 enclosed in a band 17a to form a module 4 which, when assembled, is closed by a watch back 22.

A metal plate 8 formed with an LED display window 9, a light scattering filter 10a, a numeral plate 11a in the form of a partially (half) light-transmitting reflector and hands 24 are installed in that order in the module 4 above the analog movement 6 and the LED display 5.

The numeral plate of the partially light-transmitting reflector 11a which is installed the upper side of the analog movement 6 and LED display 5 may be omitted and the metal plate 8 with the LED display window 9 may service as the numeral plate.

The module 4 further comprises a battery hold 16 for accommodating a watch battery 15.

A button is provided on one side of the case 3a to operate a switch 19 for energising the LED display 5 on demand.

In the second preferred embodiment of the invention, as shown in Figure 4, a digital wrist watch 1b comprises a module 14 in which an LED display 5 is provided on a circuit board 13 together with an LCD watch integrated circuit (IC) 21 and which is mounted in a watch case 3b above watch battery 15 accommodated in battery holder 16. A light scattering filter 10b, a partially light-transmitting reflector 11b, an LCD panel 12 and an LCD display window 17b are installed in that order in the module 14 above the circuit board 13.

Referring to Figure 3, in the case of the first embodiment of the present invention described above the LED watch circuit portion 25 and the analog watch circuit portion 30 are energised continuously by the battery 15 with the circuit portion 30 driving the hands 24 but with the LED display normally in the OFF state.

In order to illuminate the LED display 5, the switch 19 is moved once to the ON state by operating the button 18 on the wrist watch case 3a, and the LED display 5 then emits light for a predetermined period.

The light from the LED display 5 is projected on the numeral plate 11a through the light scattering filter 10a so that the present time is displayed clearly in numerals.

In the case of the second embodiment and referring to Figure 6, operation of the switch 19 linked with the button 18 causes the LED display 5 to emit light onto the LCD panel 12 through the light scattering filter 10b and the partially light-transmitting reflector 11b so that the present time is displayed in a manner enabling the time to be correctly and easily read in the dark.

As the consumption of electric current is excessive during the time when the LED display is light-emitting, the operating time of the LED display is limited to a minimum, sufficient only to read the present time, so that the current consumption is minimized and the battery 15 can have a long life.

The electrical operation of the above mentioned drive circuit for the LED watch and the analog watch will now be explained briefly with reference to Figures 3 and 6.

As shown in Figure 3, a crystal oscillator 26 is connected across input-output terminals of the internal oscillator circuit of the LED watch IC 20 and is vibrated at the frequency of 32768Hz by application of the electric potential of the battery 15. This oscillator frequency is output by a frequency divider circuit and counter circuit within the LED watch IC 20. The output frequency is converted to a code indicating the change of the time through a decoder, and is delivered to the LED display 5 which is energisable to indicate the time in numerals.

At the same time, the oscillator frequency at the output terminal of the internal oscillator circuit is converted to a motor drive pulse signal through an internal oscillator circuit, frequency dividing circuit and

converting circuit in an analog watch IC 28 connected independently through the coupling capacitor 27.

A stepper motor 29 is driven by the output of the analog watch IC 28 so as to move the hands 24 to display a time which is the same as the time delivered to the LED display.

As shown in Figure 6, in the second embodiment of the invention the analog watch circuit portion 30 is replaced by an LCD watch circuit portion 31 which is operated together with the LED watch circuit portion 25.

Since the coupling relation of the oscillator circuit portion is the same as described above with reference to Figure 3, not further detailed explanation of this is necessary.

Energisation of the LED display 5 of the simultaneously operating LED watch circuit portion incorporated in an ordinary analog watch or LCD watch enables the present time determined by the LED watch circuit portion to be displayed numerically by the light emitting operation of the LED display driven by the LED watch drive circuit, so that the time can be read correctly and easily in dark conditions when it is impossible to read the time indicated by the hands of the analog watch or the display of the LCD watch.

CLAIMS

1. A wrist watch comprising a permanently operating analog watch movement or LCD watch display and an LED digital watch display having an LED display which is operable on demand to emit light and display the current time in order to enable correct and easy reading of the time in the dark.
2. An analog wrist watch according to Claim 1, wherein the LED watch display is mounted on a circuit board in an ordinary wrist watch case with an analog watch movement, an aperture plate formed with an LED display window is mounted over the circuit board and the analog movement and a numeral plate in the form of a partially light-transmitting reflector mounted over the aperture plate, whereby on operation of the LED display to emit light the time is displayed on the numeral plate.
3. An analog wrist watch according to Claim 2, wherein a light scattering filter is mounted between the aperture plate and the numeral plate.
4. An analog wrist watch according to Claim 2 the numeral plate is omitted and, wherein the aperture plate is formed as a numeral plate.
5. An LCD wrist watch according to Claim 1, wherein the LED display and an LCD watch circuit portion are mounted on a circuit plate installed in an ordinary wrist watch case below an LCD panel, a light scattering filter and a partially light-transmitting reflector.

6. A wrist watch according to any preceding claim, wherein the operation of the LED display to emit light is controlled by a switch which is actuated by a button located externally on the wrist watch case.
7. An analog wrist watch substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.
8. An LCD wrist watch substantially as hereinbefore described with reference to the accompanying drawings.
9. Any novel feature or combination of features described herein.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

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Relevant Technical Fields

- (i) UK Cl (Ed.M) G3T (TAAA, TAAB, TAAC, TAAD, TAAE,
 TAAF, TAAZ, TRA)
 (ii) Int Cl (Ed.5) G04B; G04C; G04G

Search Examiner
 R HOWE

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Date of completion of Search
 15 JUNE 1994

(ii) ONLINE DATABASE: WPI

Documents considered relevant following a search in respect of Claims :-
 1-8

Categories of documents

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| X: | Document indicating lack of novelty or of inventive step. | P: | Document published on or after the declared priority date but before the filing date of the present application. |
| Y: | Document indicating lack of inventive step if combined with one or more other documents of the same category. | E: | Patent document published on or after, but with priority date earlier than, the filing date of the present application. |
| A: | Document indicating technological background and/or state of the art. | &: | Member of the same patent family; corresponding document. |

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 3984973 (HUGHES) see Figure 1	1,6

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